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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/827,348	04/20/2004	Chan-bong Jun	277/038	2613

7590

09/12/2005

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EXAMINER

SUMMONS, BARBARA

ART UNIT

PAPER NUMBER

2817

DATE MAILED: 09/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/827,348

Applicant(s)

JUN ET AL.

Examiner

Barbara Summons

Art Unit

2817

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6-16, 19 and 20 is/are allowed.
- 6) ☒ Claim(s) 1-3, 17 and 18 is/are rejected.
- 7) ☒ Claim(s) 4 and 5 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 11/10/04.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Claim Objections*

1. Claim 8 is objected to because of the following informalities:

In claim 8, on line 1, note that "pattering" should be - - patterning - -.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 17 and 18 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 17 recites "The method" which lacks antecedent basis depending from apparatus claim 4. Should claim 17 correctly depend from claim 6?

Claim 18 recites the feature "the dry-etching" which lacks antecedent basis in the claim. Should claim 18 correctly depend from claim 17?

### *Claim Rejections - 35 USC § 102*

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3 are rejected under 35 U.S.C. § 102(b) as being anticipated by Fukuda et al. U.S. 4,890,370 (cited by Applicants).

Fig. 1(e) of Fukuda et al. discloses a film bulk acoustic resonator 42 comprising: a semiconductor substrate 31 (see e.g. col. 3, line 31) that is "prepared" (ibid.) or controlled such that it has a predetermined thickness; a resistance layer 36 on the semiconductor substrate having a recess 37a; a membrane layer 33 on an upper portion of the resistance layer 36 and over the recess 37a, thereby forming an air gap between the membrane layer 33 and the semiconductor substrate 31 at the recess; a first electrode 38 on an upper portion of the membrane layer 33; a piezoelectric layer 39 on an upper portion of the membrane layer 33 and on an upper portion of the first electrode 38; and a second electrode 41 on an upper portion of the piezoelectric layer; and a second resistance layer 32 having a predetermined thickness in the recess 37a.

6. Claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as being anticipated by Barber et al. U.S. 6,486,751.

Fig. 6 of Barber et al. discloses a film bulk acoustic resonator (e.g. 60 in Fig. 11) comprising: a semiconductor substrate 12 (see e.g. col. 3, lines 24-25) that is "controlled" or chosen such that it has a predetermined thickness; a resistance layer 36 on the semiconductor substrate having a recess 30; a membrane layer 32 on an upper portion of the resistance layer 36 and over the recess 30, thereby forming an air gap between the membrane layer 32 and the semiconductor substrate 12 at the recess; a first electrode 18 on an upper portion of the membrane layer 32; a piezoelectric layer 20

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on an upper portion of the membrane layer 32 and on an upper portion of the first electrode 18; and a second electrode 14 on an upper portion of the piezoelectric layer.

***Allowable Subject Matter***

7. Claims 6-16, 19 and 20 are allowable over the prior art of record.
8. Claims 4 and 5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
9. Claims 17 and 18 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. § 112, 2nd paragraph, set forth in this Office action.
10. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record does not disclose or fairly suggest a method for manufacturing a film bulk acoustic resonator having all of the specifically recited steps, and especially including the step of "filling a recess", in "a resistance layer on an upper surface of a semiconductor substrate", "with a sacrificial material" (see claim 6, lines 3-5). Neither of the references applied above use a sacrificial material, and when other references of record do use sacrificial materials (see e.g. Jang et al. US 2003/0193269 cited by Applicants), the sacrificial material (Jang element 103' in Figs 5D-5J) is deposited first and a resistance layer (Jang element 105/105' in Figs. 5E-I) deposited around the sacrificial material so that the sacrificial material is not "filling a recess".

Also regarding the reference US 2002/0190814 cited by Applicants and on the International Search Report as an "X" reference, this reference does not show a recess in a resistance layer, but only shows a recess in the supporting substrate 51 (Figs. 3-10). Although the resistance layer 53 has an indentation or a concavity that follows the recess in the substrate 51, the resistance layer 53 itself is not considered to have a "recess" because it is of uniform thickness.

### ***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Aigner U.S. 6,657,363 discloses a film bulk acoustic resonator comprising a substrate 1, a resistance layer 3 having a recess 4, a membrane layer 2, a bottom electrode 5, a piezoelectric layer 6, and a top electrode 7.

Chan et al. U.S. 6,355,498 is a U.S. equivalent of the EP document cited by Applicants.

Lee U.S. 6,842,089 discloses a film bulk acoustic resonator (Fig. 3b) comprising a substrate 310, a resistance layer 340 having recesses 335, a membrane layer 350, a bottom electrode 110/210, a piezoelectric layer 120/220, and a top electrode 130/230. However, sacrificial material 330 is formed first at "step d" then layer 340 is formed around the sacrificial material at "step e" (see col. 6, lines 39-64 and col. 7, lines 1-5).

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12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barbara Summons whose telephone number is (571) 272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



**BARBARA SUMMONS**  
**PRIMARY EXAMINER**

bs  
September 8, 2005